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(54) **CONTEXTUAL MEDIA FILTER SEARCH**

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(60) Provisional application No. 62/826,679, filed on Mar. 29, 2019.

Publication Classification

(51) **Int. Cl.**

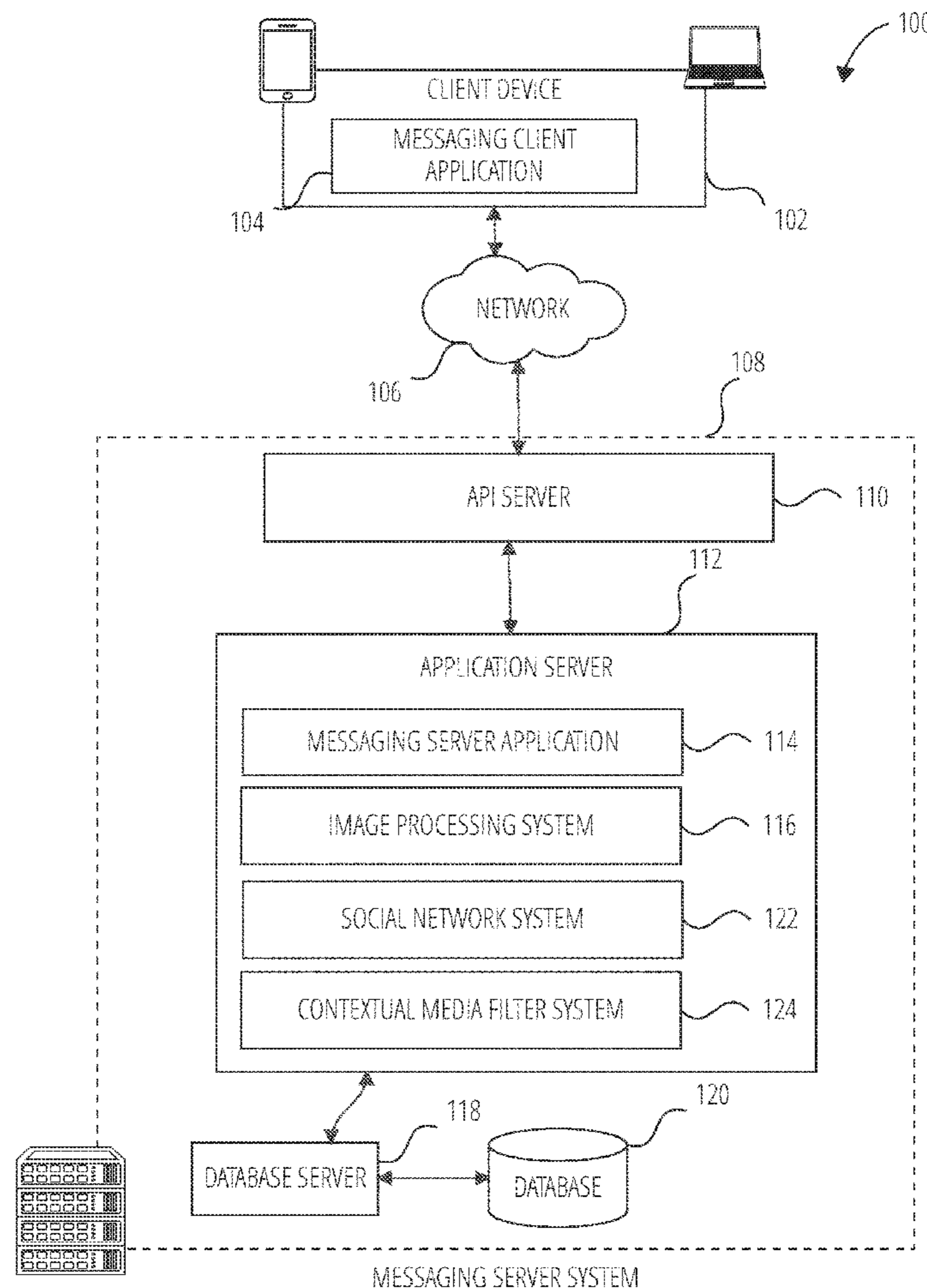
G06F 16/40 (2006.01)

G06T 11/00 (2006.01)

(57)

ABSTRACT

Method for receiving an input onto a graphical user interface at a client device, capturing an image frame at the client device, the image frame comprising a depiction of an object, identifying the object within the image frame, accessing media content associated with the object within a media repository in response to identifying the object, and causing presentation of the media content within the image frame at the client device.



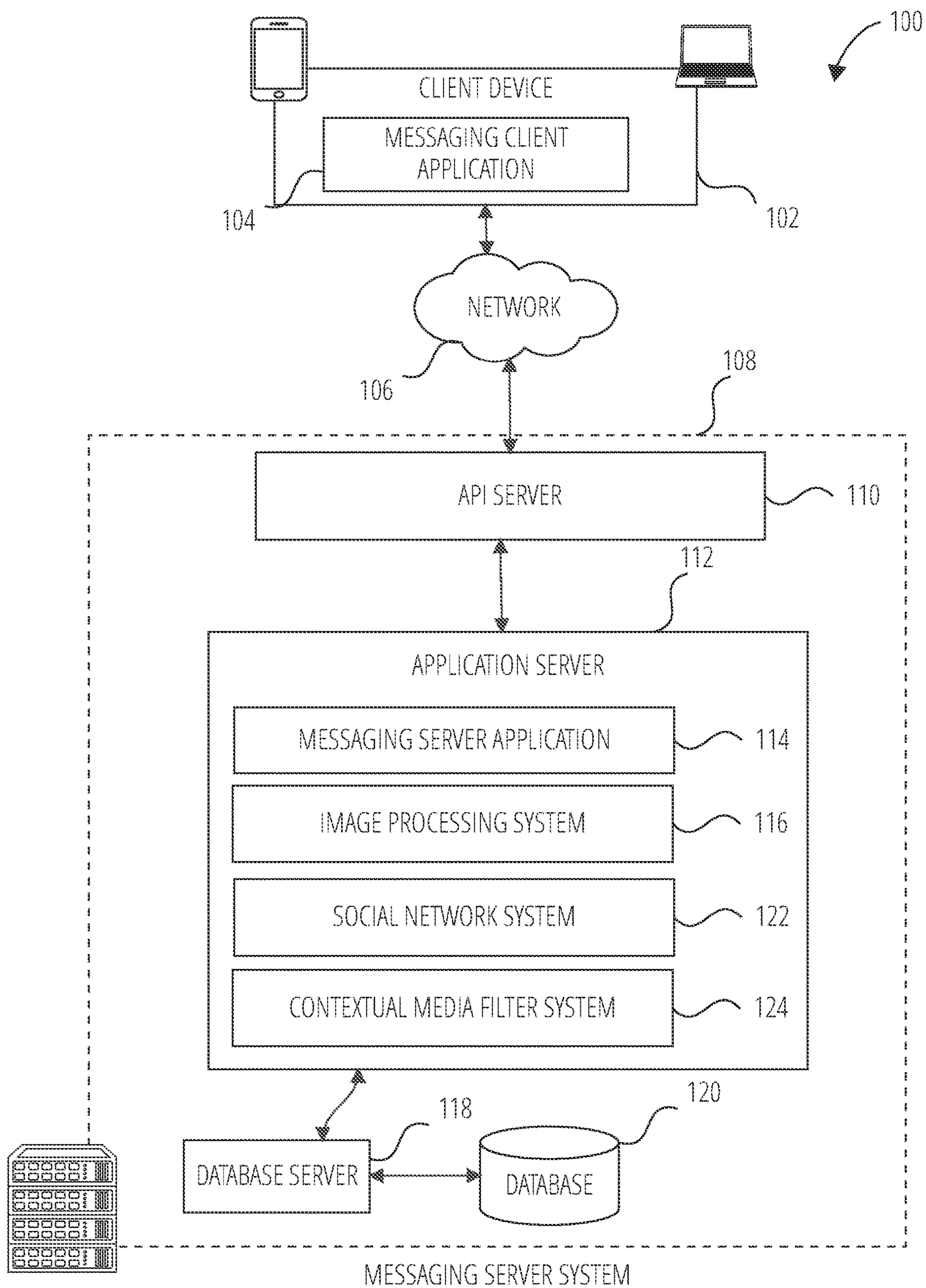


FIG. 1

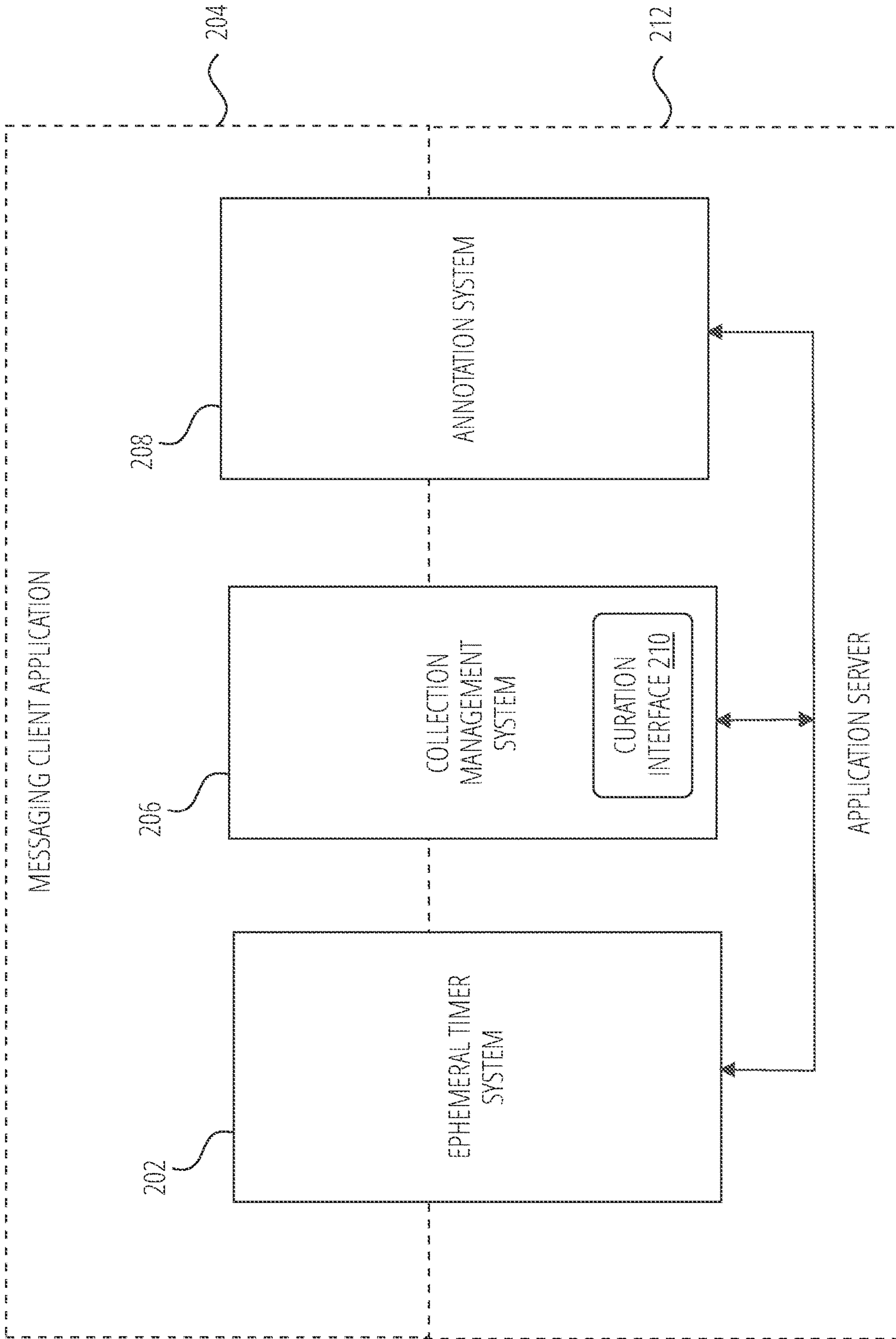


FIG. 2

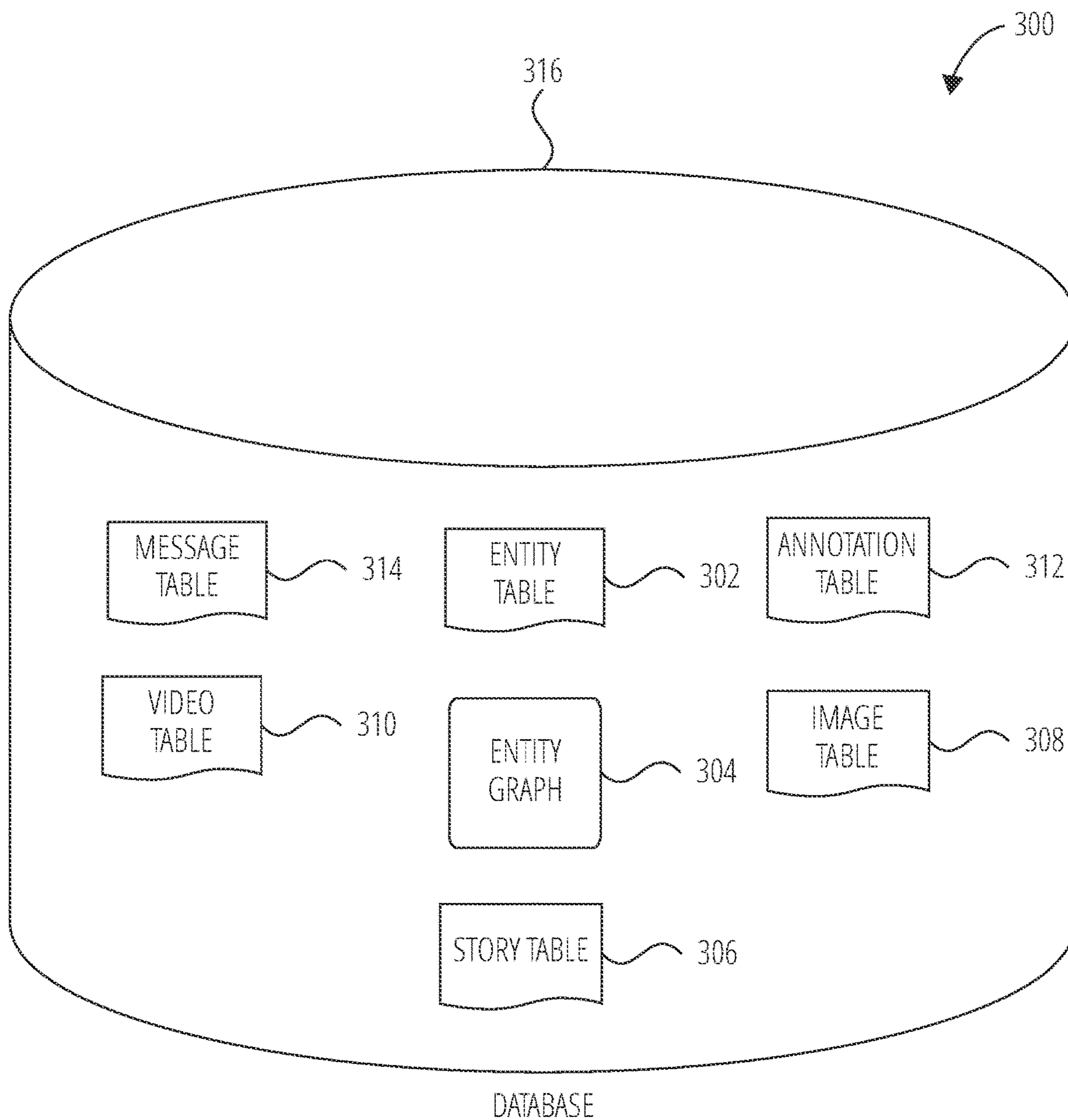


FIG. 3

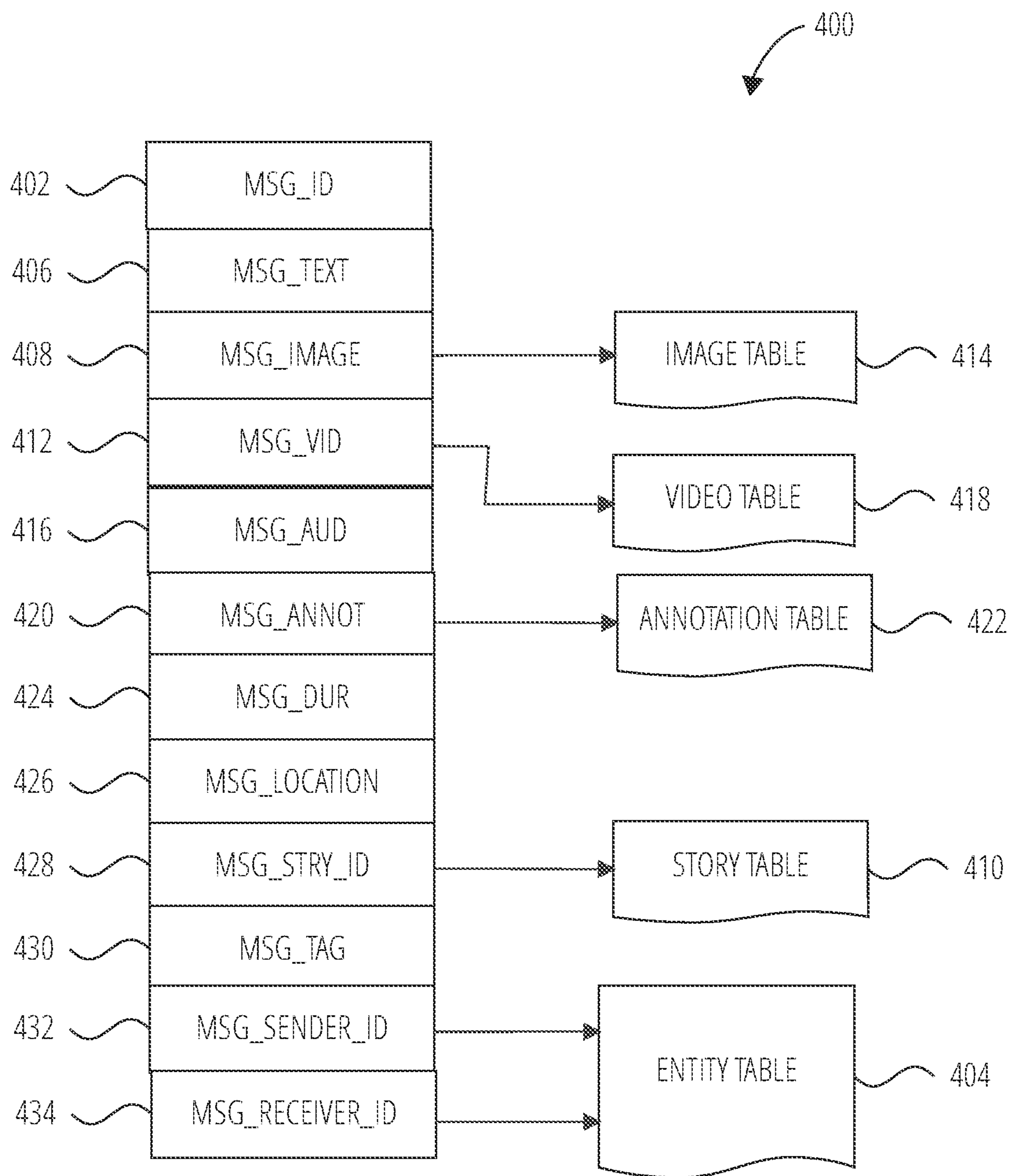


FIG. 4

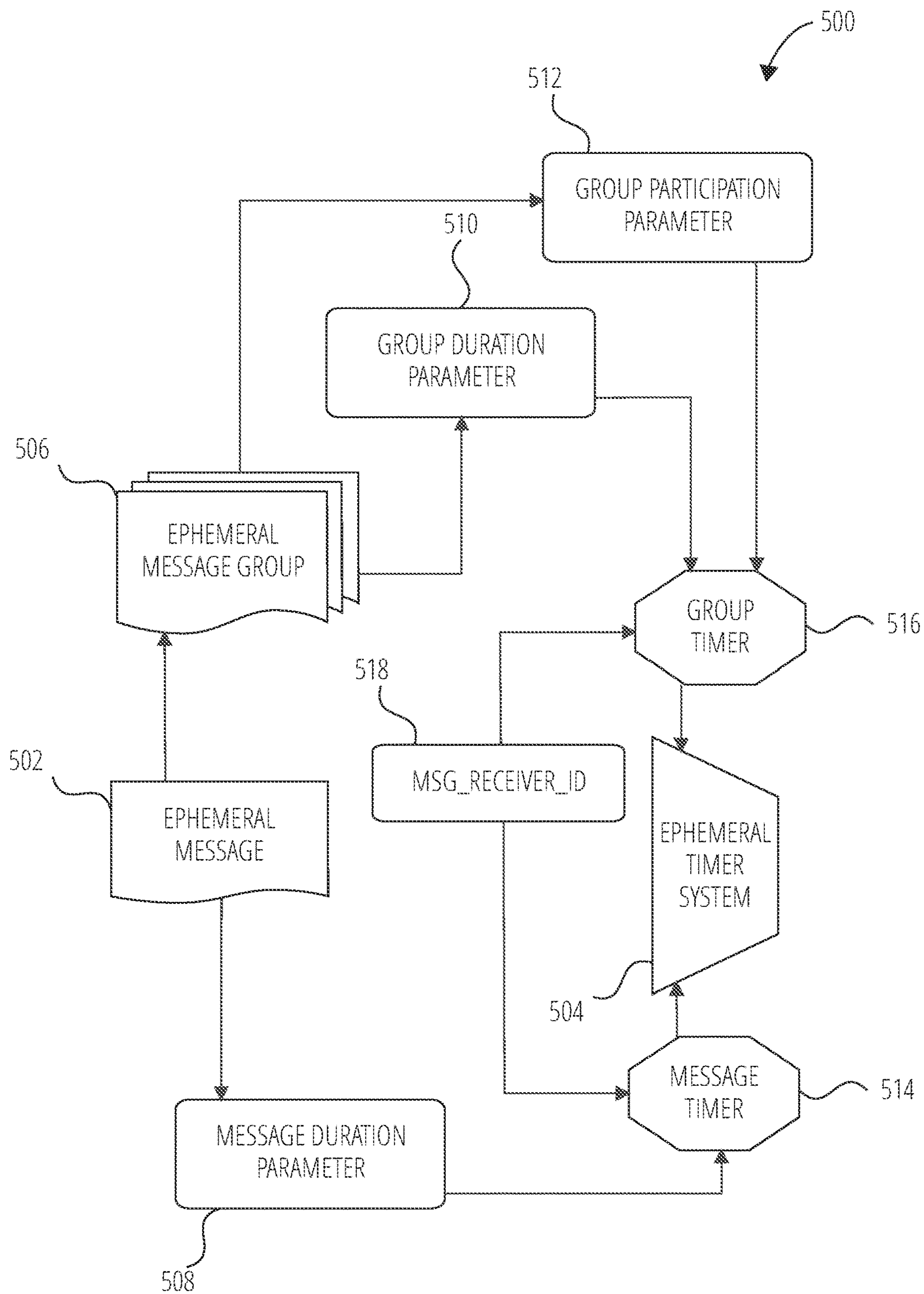


FIG. 5

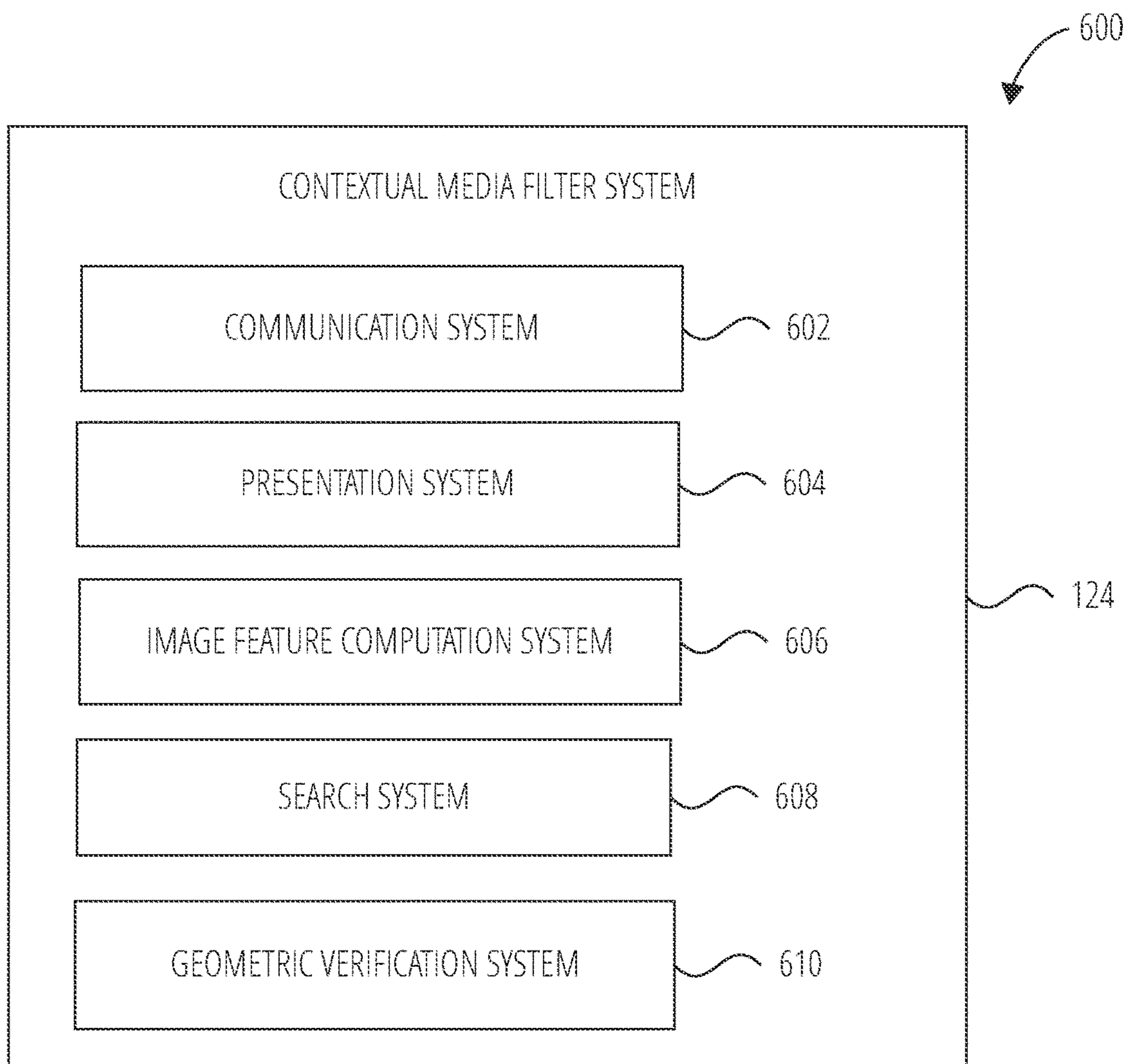


FIG. 6

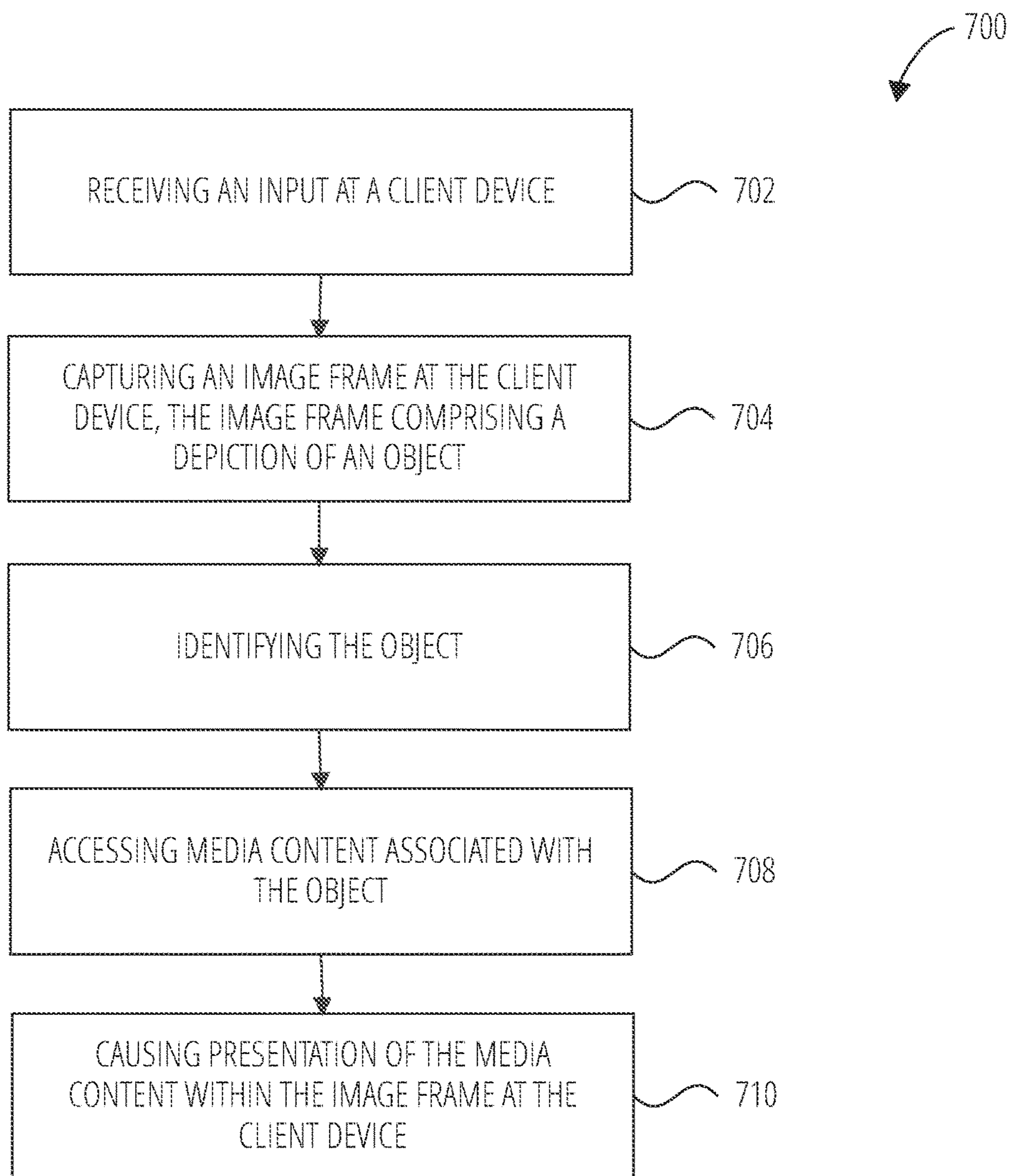


FIG. 7

800

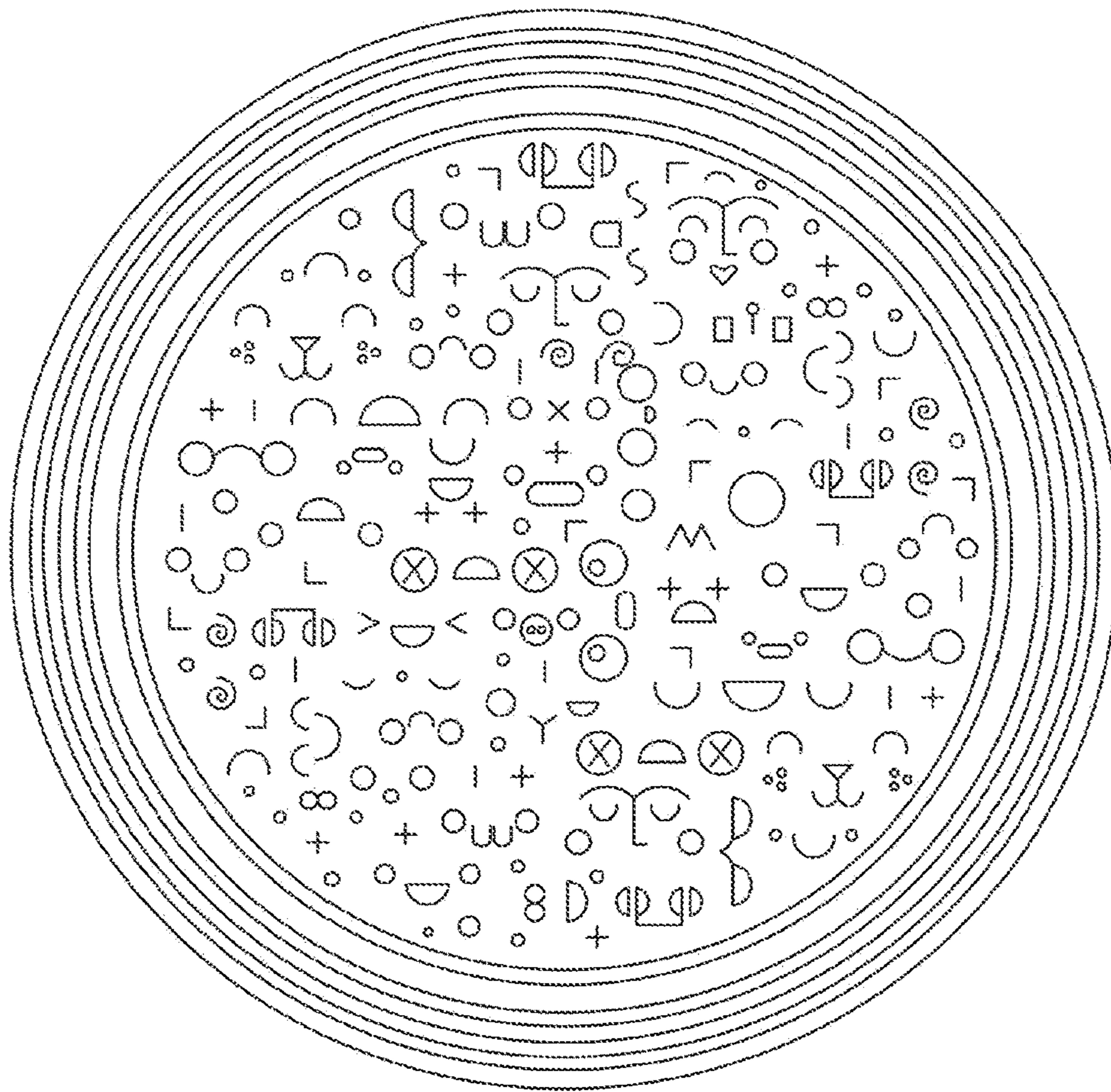


FIG. 8

900

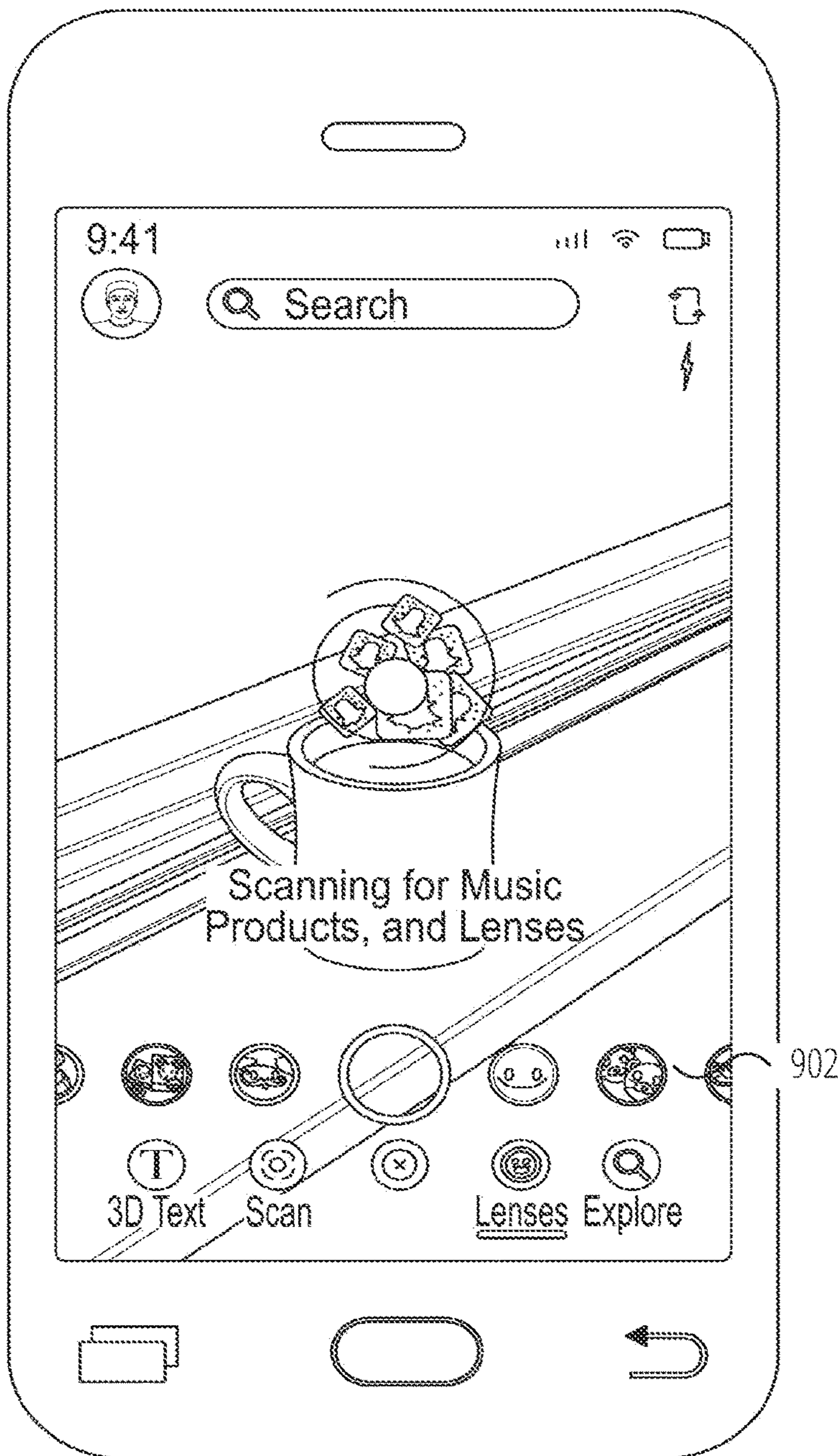


FIG. 9

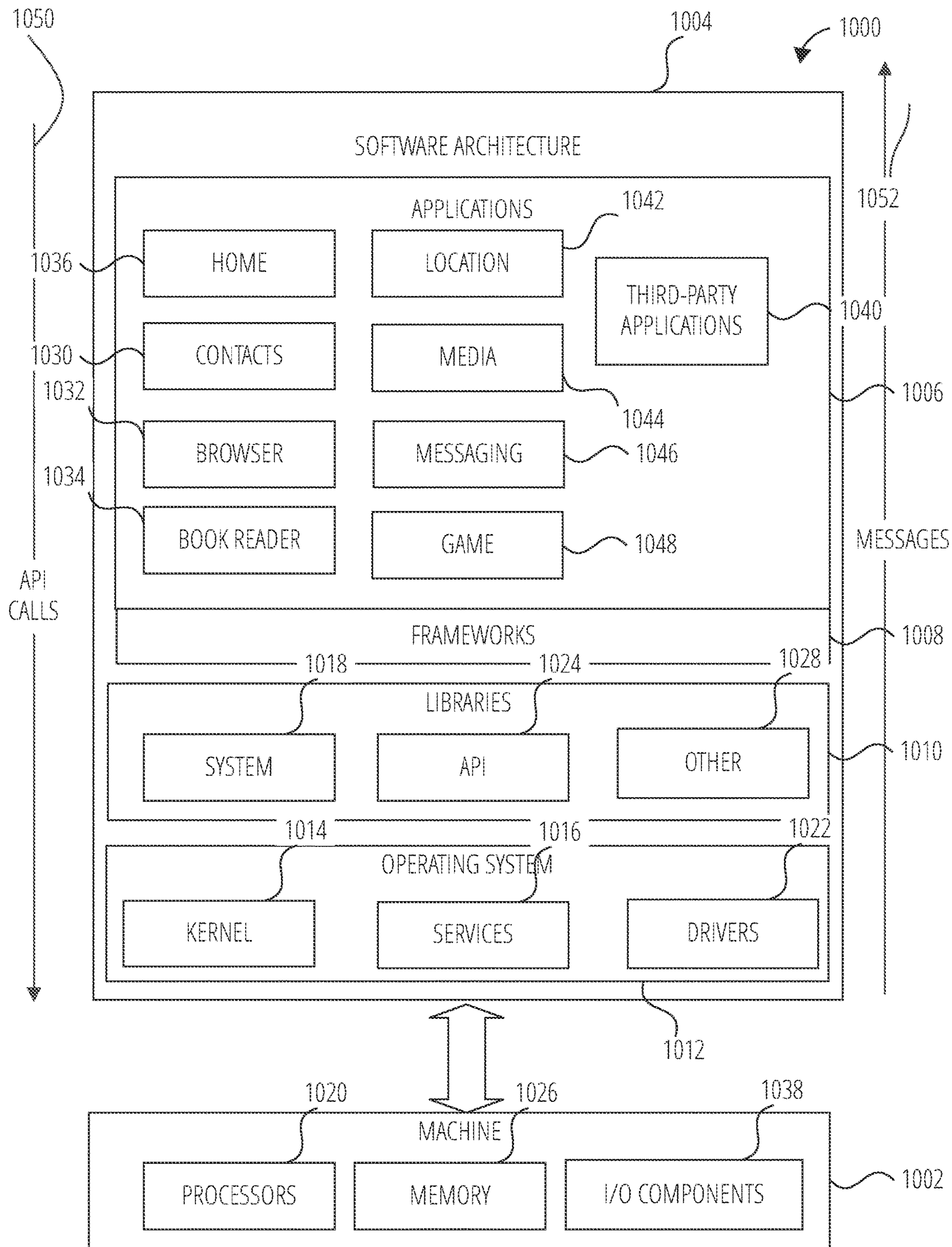


FIG. 10

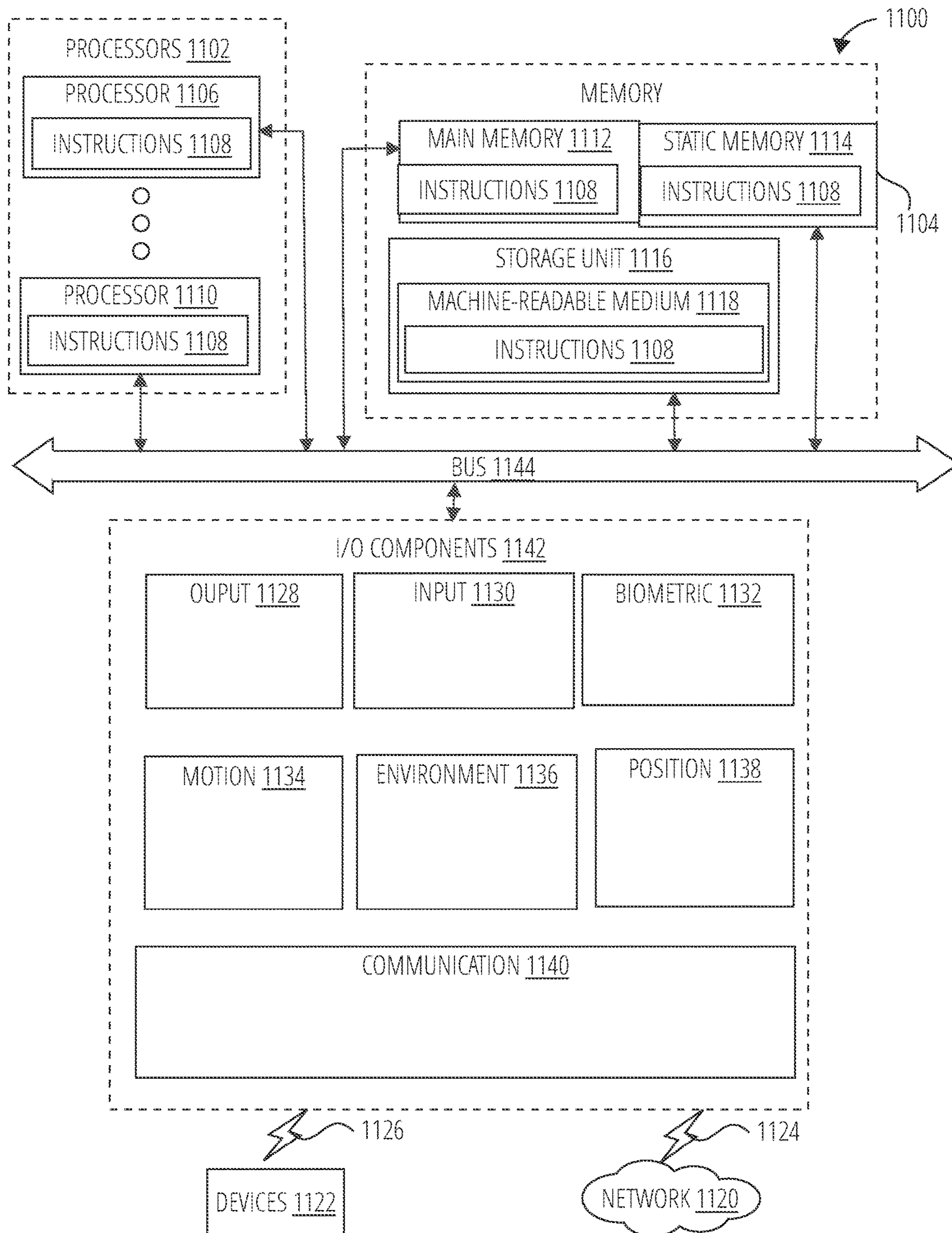


FIG. 11

CONTEXTUAL MEDIA FILTER SEARCH

PRIORITY

[0001] This application is a continuation of U.S. application Ser. No. 17/306,179, filed May 3, 2021, which is a continuation of U.S. application Ser. No. 16/814,221, filed Mar. 10, 2020, which claims the benefit of priority to U.S. Provisional Patent application Ser. No. 62/826,679, filed Mar. 29, 2019, each of which is incorporated by reference herein in its entirety.

TECHNICAL FIELD

[0002] Embodiments of the present disclosure relate generally to mobile computing technology and, more particularly, but not by way of limitation, to systems for generating and displaying dynamic contextual media content at a client device.

BACKGROUND

[0003] Augmented reality (AR), is a live direct or indirect view of a physical, real-world environment whose elements are augmented by computer-generated sensory inputs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] To easily identify the discussion of any particular element or act, the most significant digit or digits in a reference number refer to the figure number in which that element is first introduced.

[0005] In the drawings, which are not necessarily drawn to scale, like numerals may describe similar components in different views. Like numerals having different letter suffixes may represent different instances of similar components. Some embodiments are illustrated by way of example, and not limitation, in the figures of the accompanying drawings in which:

[0006] To easily identify the discussion of any particular element or act, the most significant digit or digits in a reference number refer to the figure number in which that element is first introduced.

[0007] FIG. 1 is a diagrammatic representation of a networked environment in which the present disclosure may be deployed, in accordance with some example embodiments.

[0008] FIG. 2 is a diagrammatic representation of a messaging client application, in accordance with some example embodiments.

[0009] FIG. 3 is a diagrammatic representation of a data structure as maintained in a database, in accordance with some example embodiments.

[0010] FIG. 4 is a diagrammatic representation of a message, in accordance with some example embodiments.

[0011] FIG. 5 is a flowchart for an access-limiting process, in accordance with some example embodiments.

[0012] FIG. 6 is a block diagram illustrating components of the contextual media filter system, according to some example embodiments.

[0013] FIG. 7 is a flowchart depicting a method of causing display of a contextual media filter according to certain example embodiments.

[0014] FIG. 8 is a diagrammatic illustration of an object within an image frame, according to some example embodiments.

[0015] FIG. 9 is a diagrammatic illustration of a contextual media filter system within a user interface, according to some example embodiments.

[0016] FIG. 10 is block diagram showing a software architecture within which the present disclosure may be implemented, in accordance with some example embodiments.

[0017] FIG. 11 is a diagrammatic representation of a machine, in the form of a computer system within which a set of instructions may be executed for causing the machine to perform any one or more of the methodologies discussed, in accordance with some example embodiments.

DETAILED DESCRIPTION

[0018] For purposes of explanation, specific configurations and details are set forth in order to provide a thorough understanding of the present subject matter. However, it will be apparent to one of ordinary skill in the art that embodiments of the subject matter described may be practiced without the specific details presented herein, or in various combinations, as described herein. Furthermore, well-known features may be omitted or simplified in order not to obscure the described embodiments. Various examples may be given throughout this description. These are merely descriptions of specific embodiments. The scope or meaning of the claims is not limited to the examples given.

[0019] AR systems provide users within graphical user interfaces (GUIs) to display a live direct or indirect view of a physical, real-world environment, wherein elements of the view are augmented by computer-generated sensory inputs. For example, an AR interface may present media content at positions within a display of a view of a real-world environment, such that the media content appears to interact with elements in the real-world environment.

[0020] Aspects of the present disclosure describe a contextual media filter system configured to generate and display contextual media filters at a client device. For example, the contextual media filter system is configured to perform operations that include, receiving an input onto a graphical user interface at a client device, capturing an image frame at the client device, the image frame comprising a depiction of an object, identifying the object within the image frame, accessing media content associated with the object within a media repository in response to identifying the object, and causing presenting of the media content within the image frame at the client device.

[0021] The media content may include animated Graphics Interchange Format (GIF) images, of various shapes, sizes and themes. In some embodiments, the contextual media filter system may be in communication with a media repository that comprises a sorted and labeled collection of the media content, wherein the media content within the collection of media content is labeled or tagged based on attributes of the media content. For example, the media content may be tagged with a label that identifies an object category of the media content, such as “food,” or “basketball,” such that a reference to the object category corresponds with a set of media content from among the collection of media content.

[0022] In some embodiments, responsive to receiving an input that selects a user option from among a set of user options, the contextual media filter system captures an image from a client device, wherein the image frame comprises a depiction of one or more objects in a real-world

environment. For example, the contextual media filter system may detect one or more local features (e.g., first set of features) within the image frame, wherein the local features identify an object associated with the object depicted in the image frame, or in further embodiments may also employ one or more image and text recognition techniques to identify the object depicted in the image frame. Based on the identification of the object, the contextual media filter system retrieves a set of representative features associated with the local features to compute global features (e.g., second set of features) of the image frame. The contextual media filter system may use the global features and query a media repository to identify media content based on the local features and the representative features. The contextual media filter system further geometrically verifies the media content using the local features and eliminates false media content from the media content.

[0023] In response to identifying the set of media content from the media repository, the contextual media filter system generates and causes display of the set of media content at the client device. In some embodiments, to generate the presentation of the set of media content, the contextual media filter system retrieves a media template that provides a presentation format and layout for the set of media content. For example, the media template may define positions to present the set of media content within the image frame at the client device. In some embodiments, the presentation of the set of media content within the image frame at the client device may be based on a position (or positions) of the objects identified within the image frame.

[0024] FIG. 1 is a block diagram showing an example messaging system 100 for exchanging data (e.g., messages and associated content) over a network. The messaging system 100 includes multiple instances of a client device 102, each of which hosts a number of applications including a messaging client application 104. Each messaging client application 104 is communicatively coupled to other instances of the messaging client application 104 and a messaging server system 108 via a network 106 (e.g., the Internet).

[0025] A messaging client application 104 is able to communicate and exchange data with another messaging client application 104 and with the messaging server system 108 via the network 106. The data exchanged between messaging client application 104, and between a messaging client application 104 and the messaging server system 108, includes functions (e.g., commands to invoke functions) as well as payload data (e.g., text, audio, video or other multimedia data).

[0026] The messaging server system 108 provides server-side functionality via the network 106 to a particular messaging client application 104. While certain functions of the messaging system 100 are described herein as being performed by either a messaging client application 104 or by the messaging server system 108, the location of certain functionality either within the messaging client application 104 or the messaging server system 108 is a design choice. For example, it may be technically preferable to initially deploy certain technology and functionality within the messaging server system 108, but to later migrate this technology and functionality to the messaging client application 104 where a client device 102 has a sufficient processing capacity.

[0027] The messaging server system 108 supports various services and operations that are provided to the messaging client application 104. Such operations include transmitting data to, receiving data from, and processing data generated by the messaging client application 104. This data may include, message content, client device information, geolocation information, media annotation and overlays, message content persistence conditions, social network information, and live event information, as examples. Data exchanges within the messaging system 100 are invoked and controlled through functions available via user interfaces (UIs) of the messaging client application 104.

[0028] Turning now specifically to the messaging server system 108, an Application Program Interface (API) server 110 is coupled to, and provides a programmatic interface to, an application server 112. The application server 112 is communicatively coupled to a database server 118, which facilitates access to a database 120 in which is stored data associated with messages processed by the application server 112.

[0029] The Application Program Interface (API) server 110 receives and transmits message data (e.g., commands and message payloads) between the client device 102 and the application server 112. Specifically, the Application Program Interface (API) server 110 provides a set of interfaces (e.g., routines and protocols) that can be called or queried by the messaging client application 104 in order to invoke functionality of the application server 112. The Application Program Interface (API) server 110 exposes various functions supported by the application server 112, including account registration, login functionality, the sending of messages, via the application server 112, from a particular messaging client application 104 to another messaging client application 104, the sending of media files (e.g., images or video) from a messaging client application 104 to the messaging server application 114, and for possible access by another messaging client application 104, the setting of a collection of media data (e.g., story), the retrieval of a list of friends of a user of a client device 102, the retrieval of such collections, the retrieval of messages and content, the adding and deletion of friends to a social graph, the location of friends within a social graph, and opening an application event (e.g., relating to the messaging client application 104).

[0030] The application server 112 hosts a number of applications and subsystems, including a messaging server application 114, an image processing system 116, a social network system 122 and a contextual media filter system 124.

[0031] The contextual media filter system 124 is configured to capture an image frame that includes a depiction of an object from a client device 102, identify one or more objects within the image frame based on the depiction of the object, identify one or more image features based on the object, retrieve a set of media content based on the image features, and cause display of a presentation of the set of media content within the image frame at the client device 102, according to some example embodiments. Further details of the contextual media filter system 124 can be found in FIG. 6 below.

[0032] The messaging server application 114 implements a number of message processing technologies and functions, particularly related to the aggregation and other processing of content (e.g., textual and multimedia content) included in

messages received from multiple instances of the messaging client application **104**. As will be described in further detail, the text and media content from multiple sources may be aggregated into collections of content (e.g., called stories or galleries). These collections are then made available, by the messaging server application **114**, to the messaging client application **104**. Other processor and memory intensive processing of data may also be performed server-side by the messaging server application **114**, in view of the hardware requirements for such processing.

[0033] The application server **112** also includes an image processing system **116** that is dedicated to performing various image processing operations, typically with respect to images or video received within the payload of a message at the messaging server application **114**.

[0034] The social network system **122** supports various social networking functions services and makes these functions and services available to the messaging server application **114**. To this end, the social network system **122** maintains and accesses an entity graph **304** (as shown in FIG. 3) within the database **120**. Examples of functions and services supported by the social network system **122** include the identification of other users of the messaging system **100** with which a particular user has relationships or is “following”, and also the identification of other entities and interests of a particular user.

[0035] The application server **112** is communicatively coupled to a database server **118**, which facilitates access to a database **120** in which is stored data associated with messages processed by the messaging server application **114**.

[0036] FIG. 2 is block diagram illustrating further details regarding the messaging system **100**, according to example embodiments. Specifically, the messaging system **100** is shown to comprise the messaging client application **204** and the application server **212**, which in turn embody a number of some subsystems, namely an ephemeral timer system **202**, a collection management system **206** and an annotation system **208**.

[0037] The ephemeral timer system **202** is responsible for enforcing the temporary access to content permitted by the messaging client application **204** and the messaging server application **114**. To this end, the ephemeral timer system **202** incorporates a number of timers that, based on duration and display parameters associated with a message, or collection of messages (e.g., a story), selectively display and enable access to messages and associated content via the messaging client application **204**. Further details regarding the operation of the ephemeral timer system **202** are provided below.

[0038] The collection management system **206** is responsible for managing collections of media (e.g., collections of text, image video and audio data). In some examples, a collection of content (e.g., messages, including images, video, text and audio) may be organized into an “event gallery” or an “event story.” Such a collection may be made available for a specified time period, such as the duration of an event to which the content relates. For example, content relating to a music concert may be made available as a “story” for the duration of that music concert. The collection management system **206** may also be responsible for publishing an icon that provides notification of the existence of a particular collection to the user interface of the messaging client application **204**.

[0039] The collection management system **206** furthermore includes a curation interface **210** that allows a collection manager to manage and curate a particular collection of content. For example, the curation interface **210** enables an event organizer to curate a collection of content relating to a specific event (e.g., delete inappropriate content or redundant messages). Additionally, the collection management system **206** employs machine vision (or image recognition technology) and content rules to automatically curate a content collection. In certain embodiments, compensation may be paid to a user for inclusion of user-generated content into a collection. In such cases, the curation interface **210** operates to automatically make payments to such users for the use of their content.

[0040] The annotation system **208** provides various functions that enable a user to annotate or otherwise modify or edit media content associated with a message. For example, the annotation system **208** provides functions related to the generation and publishing of media overlays for messages processed by the messaging system **100**. The annotation system **208** operatively supplies a media overlay or supplementation (e.g., an image filter) to the messaging client application **204** based on a geolocation of the client device **102**. In another example, the annotation system **208** operatively supplies a media overlay to the messaging client application **204** based on other information, such as social network information of the user of the client device **102**. A media overlay may include audio and visual content and visual effects. Examples of audio and visual content include pictures, texts, logos, animations, and sound effects. An example of a visual effect includes color overlaying. The audio and visual content or the visual effects can be applied to a media content item (e.g., a photo) at the client device **102**. For example, the media overlay may include text that can be overlaid on top of a photograph taken by the client device **102**. In another example, the media overlay includes an identification of a location overlay (e.g., Venice beach), a name of a live event, or a name of a merchant overlay (e.g., Beach Coffee House). In another example, the annotation system **208** uses the geolocation of the client device **102** to identify a media overlay that includes the name of a merchant at the geolocation of the client device **102**. The media overlay may include other indicia associated with the merchant. The media overlays may be stored in the database **120** and accessed through the database server **118**.

[0041] In one example embodiment, the annotation system **208** provides a user-based publication platform that enables users to select a geolocation on a map, and upload content associated with the selected geolocation. The user may also specify circumstances under which a particular media overlay should be offered to other users. The annotation system **208** generates a media overlay that includes the uploaded content and associates the uploaded content with the selected geolocation.

[0042] In another example embodiment, the annotation system **208** provides a merchant-based publication platform that enables merchants to select a particular media overlay associated with a geolocation via a bidding process. For example, the annotation system **208** associates the media overlay of a highest bidding merchant with a corresponding geolocation for a predefined amount of time.

[0043] FIG. 3 is a schematic diagram illustrating data structures **300** which may be stored in the database **316** of the messaging server system **108**, according to certain

example embodiments. While the content of the database 316 is shown to comprise a number of tables, it will be appreciated that the data could be stored in other types of data structures (e.g., as an object-oriented database).

[0044] The database 316 includes message data stored within a message table 314. The entity table 302 stores entity data, including an entity graph 304. Entities for which records are maintained within the entity table 302 may include individuals, corporate entities, organizations, objects, places, events, etc. Regardless of type, any entity regarding which the messaging server system 108 stores data may be a recognized entity. Each entity is provided with a unique identifier, as well as an entity type identifier (not shown).

[0045] The entity graph 304 furthermore stores information regarding relationships and associations between entities. Such relationships may be social, professional (e.g., work at a common corporation or organization) interest-based or activity-based, merely for example.

[0046] The database 316 also stores annotation data, in the example form of filters, in an annotation table 312. Filters for which data is stored within the annotation table 312 are associated with and applied to videos (for which data is stored in a video table 310) and/or images (for which data is stored in an image table 308). Filters, in one example, are overlays that are displayed as overlaid on an image or video during presentation to a recipient user. Filters may be of various types, including user-selected filters from a gallery of filters presented to a sending user by the messaging client application 104 when the sending user is composing a message. Other types of filters include geolocation filters (also known as geo-filters) which may be presented to a sending user based on geographic location. For example, geolocation filters specific to a neighborhood or special location may be presented within a user interface by the messaging client application 104, based on geolocation information determined by a GPS unit of the client device 102. Another type of filter is a data filter, which may be selectively presented to a sending user by the messaging client application 104, based on other inputs or information gathered by the client device 102 during the message creation process. Example of data filters include current temperature at a specific location, a current speed at which a sending user is traveling, battery life for a client device 102, or the current time.

[0047] Other annotation data that may be stored within the image table 308 is so-called Lenses® data. Lenses® may be a real-time special effect and sound that may be added to an image or a video.

[0048] In a social messaging system, content (e.g. images and video clips) may be communicated as part of the messaging. One way of customizing such content is the use of Lenses® which modifies or transforms the content in some way. For example, complex additions or transformations to the content images may be performed using Lenses® data, such as adding rabbit ears to the head of a person in a video clip, adding floating hearts with background coloring to a video clip, altering the proportions of a person's features within a video clip, or many numerous other such transformations. In order to both provide unique user experiences, to provide attribution to Lenses® creators, and to enable creators to protect various aspects of data within the messaging system, the system may provide tools both for users to generate and share such Lenses®, as well

as limiting access to such filters in various ways. As described above, Lenses® in accordance with embodiments described herein refer to modifications that may be made to videos or images. This includes both real-time modification which modifies an image as it is captured using a device sensor and then displayed on a screen of the device with the Lenses® modifications. This also includes modifications to stored content, such as video clips in a gallery that may be modified using Lenses®. For example, in a creator profile with multiple Lenses®, an authorized third party account may use a single video clip with multiple Lenses® to see how the different Lenses® will modify the stored clip. Similarly, real-time video capture may be used with Lenses® to show how video images currently being captured by sensors of a device would modify the captured data. Such data may simply be displayed on the screen and not stored in memory, or the content captured by the device sensors may be recorded and stored in memory with or without the Lenses® modifications (or both).

[0049] Lenses® data and various systems to use Lenses® and modify content using Lenses® may thus involve detection of objects (e.g. faces, hands, bodies, cats, dogs, surfaces, objects, etc), tracking of such objects as they leave, enter, and move around the field of view in video frames, and the modification or transformation of such objects as they are tracked. In various embodiments, different methods for achieving such transformations may be used. For example, some embodiments may involve generating a three-dimensional mesh model of the object or objects, and using transformations and animated textures of the model within the video to achieve the transformation. In other embodiments, tracking of points on an object may be used to place an image or texture (which may be two dimensional or three dimensional) at the tracked position. In still further embodiments, neural network analysis of video frames may be used to place images, models, or textures in content (e.g. images or frames of video). Lenses® data thus refers both to the images, models, and textures used to create transformations in content, as well as to additional modeling and analysis information needed to achieve such transformations with object detection, tracking, and placement.

[0050] Real time video processing can be performed with any kind of video data, (e.g. video streams, video files, etc.) saved in a memory of a computerized system of any kind. For example, a user can load video files and save them in a memory of a device, or can generate a video stream using sensors of the device. Additionally, any objects can be processed using Lenses®, such as a human's face and parts of a human body, animals, or non-living things such as chairs, cars, or other objects.

[0051] In some embodiments, when a Lenses® is selected along with content to be transformed, elements to be transformed by the Lenses® are identified by the computing device, and then detected and tracked if they are present in the frames of the video. The elements of the object are modified according to the request for modification, thus transforming the frames of the video stream. Transformation of frames of a video stream can be performed by different methods for different kinds of transformation. For example, for transformations of frames mostly referring to changing forms of object's elements characteristic points for each of element of an object are calculated (e.g. using an Active Shape Model (ASM) or other known methods). Then, a mesh based on the characteristic points is generated for each

of the at least one element of the object. This mesh used in the following stage of tracking the elements of the object in the video stream. In the process of tracking, the mentioned mesh for each element is aligned with a position of each element. Then, additional points are generated on the mesh. A first set of first points is generated for each element based on a request for modification, and a set of second points is generated for each element based on the set of first points and the request for modification. Then, the frames of the video stream can be transformed by modifying the elements of the object on the basis of the sets of first and second points and the mesh. In such method a background of the modified object can be changed or distorted as well by tracking and modifying the background.

[0052] In one or more embodiments, transformations changing some areas of an object using its elements can be performed by calculating of characteristic points for each element of an object and generating a mesh based on the calculated characteristic points. Points are generated on the mesh, and then various areas based on the points are generated. The elements of the object are then tracked by aligning the area for each element with a position for each of the at least one element, and properties of the areas can be modified based on the request for modification, thus transforming the frames of the video stream. Depending on the specific request for modification properties of the mentioned areas can be transformed in different ways. Such modifications may involve: changing color of areas; removing at least some part of areas from the frames of the video stream; including one or more new objects into areas which are based on a request for modification; and modifying or distorting the elements of an area or object. In various embodiments, any combination of such modifications or other similar modifications may be used.

[0053] In some embodiments, Lenses® may provide augmented reality (AR) experiences. For example the AR experiences may provide an interactive experience of a real-world environment where the objects within the real-world environment are enhanced by computer-generated information such as video and audio.

[0054] In some embodiments of Lenses® using face detection, the face is detected on an image with use of a specific face detection algorithm (e.g. Viola-Jones). Then, an Active Shape Model (ASM) algorithm is applied to the face region of an image to detect facial feature reference points.

[0055] In other embodiments, other methods and algorithms suitable for face detection can be used. For example, in some embodiments, features are located using a landmark which represents a distinguishable point present in most of the images under consideration. For facial landmarks, for example, the location of the left eye pupil may be used. In an initial landmark is not identifiable (e.g. if a person has an eyepatch), secondary landmarks may be used. Such landmark identification procedures may be used for any such objects. In some embodiments, a set of landmarks forms a shape. Shapes can be represented as vectors using the coordinates of the points in the shape. One shape is aligned to another with a similarity transform (allowing translation, scaling, and rotation) that minimizes the average Euclidean distance between shape points. The mean shape is the mean of the aligned training shapes.

[0056] In some embodiments, a search for landmarks from the mean shape aligned to the position and size of the face determined by a global face detector is started. Such a search

then repeats the steps of suggesting a tentative shape by adjusting the locations of shape points by template matching of the image texture around each point and then conforming the tentative shape to a global shape model until convergence occurs. In some systems, individual template matches are unreliable and the shape model pools the results of the weak template matchers to form a stronger overall classifier. The entire search is repeated at each level in an image pyramid, from coarse to fine resolution.

[0057] Embodiments of a transformation system can capture an image or video stream on a client device and perform complex image manipulations locally on a client device such as client device **102** while maintaining a suitable user experience, computation time, and power consumption. The complex image manipulations may include size and shape changes, emotion transfers (e.g., changing a face from a frown to a smile), state transfers (e.g., aging a subject, reducing apparent age, changing gender), style transfers, graphical element application, and any other suitable image or video manipulation implemented by a convolutional neural network that has been configured to execute efficiently on a client device.

[0058] In some example embodiments, Lenses® may be used by a system where a user may capture an image or video stream of the user (e.g., a selfie) using a client device **102** having a neural network operating as part of a messaging application **104** operating on the client device **102**. The transform system operating within the messaging application **104** determines the presence of a face within the image or video stream and provides modification icons associated with the Lenses®, or the Lenses® may be present as associated with an interface described herein. The modification icons include changes which may be the basis for modifying the user's face within the image or video stream as part of the Lenses® operation. Once a modification icon is selected, the transform system initiates a process to convert the image of the user to reflect the selected modification icon (e.g., generate a smiling face on the user). In some embodiments, a modified image or video stream may be presented in a graphical user interface displayed on the mobile client device as soon as the image or video stream is captured and a specified modification is selected. The transform system may implement a complex convolutional neural network on a portion of the image or video stream to generate and apply the selected modification. That is, the user may capture the image or video stream and be presented with a modified result in real time or near real time once a modification icon has been selected. Further, the modification may be persistent while the video stream is being captured and the selected modification icon remains toggled. Machine taught neural networks may be used to enable such modifications.

[0059] In some embodiments, the graphical user interface, presenting the modification performed by the transform system, may supply the user with additional interaction options. Such options may be based on the interface used to initiate the content capture and Lenses® selection (e.g. initiation from a content creator user interface) In various embodiments, a modification may be persistent after an initial selection of a modification icon. The user may toggle the modification on or off by tapping or otherwise selecting the face being modified by the transformation system, and store it for later viewing or browse to other areas of the imaging application. Where multiple faces are modified by

the transformation system, the user may toggle the modification on or off globally by tapping or selecting a single face modified and displayed within a graphical user interface. In some embodiments, individual faces, among a group of multiple faces, may be individually modified or such modifications may be individually toggled by tapping or selecting the individual face or a series of individual faces displayed within the graphical user interface.

[0060] As mentioned above, the video table 310 stores video data which, in one embodiment, is associated with messages for which records are maintained within the message table 314. Similarly, the image table 308 stores image data associated with messages for which message data is stored in the entity table 302. The entity table 302 may associate various annotations from the annotation table 312 with various images and videos stored in the image table 308 and the video table 310.

[0061] A story table 306 stores data regarding collections of messages and associated image, video, or audio data, which are compiled into a collection (e.g., a story or a gallery). The creation of a particular collection may be initiated by a particular user (e.g., each user for which a record is maintained in the entity table 302). A user may create a “personal story” in the form of a collection of content that has been created and sent/broadcast by that user. To this end, the user interface of the messaging client application 104 may include an icon that is user-selectable to enable a sending user to add specific content to his or her personal story.

[0062] A collection may also constitute a “live story,” which is a collection of content from multiple users that is created manually, automatically, or using a combination of manual and automatic techniques. For example, a “live story” may constitute a curated stream of user-submitted content from various locations and events. Users whose client devices have location services enabled and are at a common location event at a particular time may, for example, be presented with an option, via a user interface of the messaging client application 104, to contribute content to a particular live story. The live story may be identified to the user by the messaging client application 104, based on his or her location. The end result is a “live story” told from a community perspective.

[0063] A further type of content collection is known as a “location story”, which enables a user whose client device 102 is located within a specific geographic location (e.g., on a college or university campus) to contribute to a particular collection. In some embodiments, a contribution to a location story may require a second degree of authentication to verify that the end user belongs to a specific organization or other entity (e.g., is a student on the university campus).

[0064] FIG. 4 is a schematic diagram illustrating a structure of a message 400, according to some in some embodiments, generated by a messaging client application 104 for communication to a further messaging client application 204 or the messaging server application 114. The content of a particular message 400 is used to populate the message table 314 stored within the database 120, accessible by the messaging server application 114. Similarly, the content of a message 400 is stored in memory as “in-transit” or “in-flight” data of the client device 102 or the application server 112. The message 400 is shown to include the following components:

[0065] A message identifier 402: a unique identifier that identifies the message 400.

[0066] A message text payload 406: text, to be generated by a user via a user interface of the client device 102 and that is included in the message 400.

[0067] A message image payload 408: image data, captured by a camera component of a client device 102 or retrieved from a memory component of a client device 102, and that is included in the message 400.

[0068] A message video payload 412: video data, captured by a camera component or retrieved from a memory component of the client device 102 and that is included in the message 400.

[0069] A message audio payload 416: audio data, captured by a microphone or retrieved from a memory component of the client device 102, and that is included in the message 400.

[0070] A message annotations 420: annotation data (e.g., filters, stickers or other enhancements) that represents annotations to be applied to message image payload 408, message video payload 412, or message audio payload 416 of the message 400.

[0071] A message duration parameter 424: parameter value indicating, in seconds, the amount of time for which content of the message (e.g., the message image payload 408, message video payload 412, message audio payload 416) is to be presented or made accessible to a user via the messaging client application 104.

[0072] A message geolocation parameter 426: geolocation data (e.g., latitudinal and longitudinal coordinates) associated with the content payload of the message. Multiple message geolocation parameter 426 values may be included in the payload, each of these parameter values being associated with respect to content items included in the content (e.g., a specific image into within the message image payload 408, or a specific video in the message video payload 412).

[0073] A message story identifier 428: identifier values identifying one or more content collections (e.g., “stories”) with which a particular content item in the message image payload 408 of the message 400 is associated. For example, multiple images within the message image payload 408 may each be associated with multiple content collections using identifier values.

[0074] A message tag 430: each message 400 may be tagged with multiple tags, each of which is indicative of the subject matter of content included in the message payload. For example, where a particular image included in the message image payload 408 depicts an animal (e.g., a lion), a tag value may be included within the message tag 430 that is indicative of the relevant animal. Tag values may be generated manually, based on user input, or may be automatically generated using, for example, image recognition.

[0075] A message sender identifier 432: an identifier (e.g., a messaging system identifier, email address, or device identifier) indicative of a user of the client device 102 on which the message 400 was generated and from which the message 400 was sent

[0076] A message receiver identifier 434: an identifier (e.g., a messaging system identifier, email address, or device identifier) indicative of a user of the client device 102 to which the message 400 is addressed.

[0077] The contents (e.g., values) of the various components of message **400** may be pointers to locations in tables within which content data values are stored. For example, an image value in the message image payload **408** may be a pointer to (or address of) a location within an image table **414**. Similarly, values within the message video payload **412** may point to data stored within a video table **418**, values stored within the message annotations **420** may point to data stored in an annotation table **422**, values stored within the message story identifier **428** may point to data stored in a story table **410**, and values stored within the message sender identifier **432** and the message receiver identifier **434** may point to user records stored within an entity table **404**.

[0078] FIG. **5** is a schematic diagram illustrating an access-limiting process **500**, in terms of which access to content (e.g., an ephemeral message **502**, and associated multimedia payload of data) or a content collection (e.g., an ephemeral message group **506**) may be time-limited (e.g., made ephemeral).

[0079] An ephemeral message **502** is shown to be associated with a message duration parameter **508**, the value of which determines an amount of time that the ephemeral message **502** will be displayed to a receiving user of the ephemeral message **502** by the messaging client application **104**. In one embodiment, an ephemeral message **502** is viewable by a receiving user for up to a maximum of 10 seconds, depending on the amount of time that the sending user specifies using the message duration parameter **508**.

[0080] The message duration parameter **508** and the message receiver identifier **518** are shown to be inputs to a message timer **514**, which is responsible for determining the amount of time that the ephemeral message **502** is shown to a particular receiving user identified by the message receiver identifier **518**. In particular, the ephemeral message **502** will only be shown to the relevant receiving user for a time period determined by the value of the message duration parameter **508**. The message timer **514** is shown to provide output to a more generalized ephemeral timer system **504**, which is responsible for the overall timing of display of content (e.g., an ephemeral message **502**) to a receiving user.

[0081] The ephemeral message **502** is shown in FIG. **5** to be included within an ephemeral message group **506** (e.g., a collection of messages in a personal story, or an event story). The ephemeral message group **506** has an associated group duration parameter **510**, a value of which determines a time-duration for which the ephemeral message group **506** is presented and accessible to users of the messaging system **100**. The group duration parameter **510**, for example, may be the duration of a music concert, where the ephemeral message group **506** is a collection of content pertaining to that concert. Alternatively, a user (either the owning user or a curator user) may specify the value for the group duration parameter **510** when performing the setup and creation of the ephemeral message group **506**.

[0082] Additionally, each ephemeral message **502** within the ephemeral message group **506** has an associated group participation parameter **512**, a value of which determines the duration of time for which the ephemeral message **502** will be accessible within the context of the ephemeral message group **506**. Accordingly, a particular ephemeral message group **506** may “expire” and become inaccessible within the context of the ephemeral message group **506**, prior to the ephemeral message group **506** itself expiring in terms of the group duration parameter **510**. The group duration param-

eter **510**, group participation parameter **512**, and message receiver identifier **518** each provide input to a group timer **516**, which operationally determines, firstly, whether a particular ephemeral message **502** of the ephemeral message group **506** will be displayed to a particular receiving user and, if so, for how long. Note that the ephemeral message group **506** is also aware of the identity of the particular receiving user as a result of the message receiver identifier **518**.

[0083] Accordingly, the group timer **516** operationally controls the overall lifespan of an associated ephemeral message group **506**, as well as an individual ephemeral message **502** included in the ephemeral message group **506**. In one embodiment, each and every ephemeral message **502** within the ephemeral message group **506** remains viewable and accessible for a time-period specified by the group duration parameter **510**. In a further embodiment, a certain ephemeral message **502** may expire, within the context of ephemeral message group **506**, based on a group participation parameter **512**. Note that a message duration parameter **508** may still determine the duration of time for which a particular ephemeral message **502** is displayed to a receiving user, even within the context of the ephemeral message group **506**. Accordingly, the message duration parameter **508** determines the duration of time that a particular ephemeral message **502** is displayed to a receiving user, regardless of whether the receiving user is viewing that ephemeral message **502** inside or outside the context of an ephemeral message group **506**.

[0084] The ephemeral timer system **504** may furthermore operationally remove a particular ephemeral message **502** from the ephemeral message group **506** based on a determination that it has exceeded an associated group participation parameter **512**. For example, when a sending user has established a group participation parameter **512** of 24 hours from posting, the ephemeral timer system **504** will remove the relevant ephemeral message **502** from the ephemeral message group **506** after the specified 24 hours. The ephemeral timer system **504** also operates to remove an ephemeral message group **506** either when the group participation parameter **512** for each and every ephemeral message **502** within the ephemeral message group **506** has expired, or when the ephemeral message group **506** itself has expired in terms of the group duration parameter **510**.

[0085] In certain use cases, a creator of a particular ephemeral message group **506** may specify an indefinite group duration parameter **510**. In this case, the expiration of the group participation parameter **512** for the last remaining ephemeral message **502** within the ephemeral message group **506** will determine when the ephemeral message group **506** itself expires. In this case, a new ephemeral message **502**, added to the ephemeral message group **506**, with a new group participation parameter **512**, effectively extends the life of an ephemeral message group **506** to equal the value of the group participation parameter **512**.

[0086] Responsive to the ephemeral timer system **504** determining that an ephemeral message group **506** has expired (e.g., is no longer accessible), the ephemeral timer system **504** communicates with the messaging system **100** (and, for example, specifically the messaging client application **104** to cause an indicium (e.g., an icon) associated with the relevant ephemeral message group **506** to no longer be displayed within a user interface of the messaging client application **104**. Similarly, when the ephemeral timer system

202 determines that the message duration parameter **508** for a particular ephemeral message **502** has expired, the ephemeral timer system **504** causes the messaging client application **104** to no longer display an indicium (e.g., an icon or textual identification) associated with the ephemeral message **502**.

[0087] FIG. 6 is a block diagram illustrating components of the contextual media filter system **124** that configure the contextual media filter system **124** to capture an image frame that includes a depiction of an object from a client device **102**, identify one or more objects within the image frame based on the depiction of the object, identify one or more image features based on the object, retrieve a set of media content based on the image features, and cause display of a presentation of the set of media content within the image frame at the client device **102**, according to some example embodiments.

[0088] The contextual media filter system **124** is shown as including a presentation system **604**, image feature computation system **606**, a search system **608**, and a geometric verification system **610**, all configured to communicate with each other (e.g., via bus, shared memory, or a switch). Any one or more of these systems may be implemented using one or more processors (e.g., by configuring such one or more processors to perform functions described for that system and hence may include one or more processors).

[0089] Any one or more of the systems described may be implemented using hardware alone (e.g., one or more of the processors of a machine) or a combination of hardware and software. For example, any system described of the contextual media filter system **124** may physically include an arrangement of one or more of the processors (e.g., a subset of or among the one or more processors of the machine) configured to perform the operations described herein for that system. As another example, any system of the contextual media filter system **124** may include software, hardware, or both, that configure an arrangement of one or more processors (e.g., among the one or more processors of the machine) to perform the operations described herein for that system. Accordingly, different systems of the contextual media filter system **124** may include and configure different arrangements of such processors or a single arrangement of such processors at different points in time. Moreover, any two or more systems of the contextual media filter system **124** may be combined into a single system, and the functions described herein for a single system may be subdivided among multiple systems. Furthermore, according to various example embodiments, systems described herein as being implemented within a single machine, database, or device may be distributed across multiple machines, databases, or devices.

[0090] FIG. 7 is a flowchart depicting a method **700** of causing display of a contextual media filter at a client device **102**, according to certain example embodiments. Operations of the method **700** may be performed by the systems described above with respect to FIG. 6. As showing in FIG. 7, the method **700** includes one or more operations **702**, **704**, **706**, **708**, and **710**.

[0091] At operation **702** the communication system **602** receives an input from the client device **102**. In some embodiments, the client device **102** includes a touch-screen display configured to receive tactile inputs. The input may therefore include a tactile input onto a display of the client device **102**, wherein the tactile input provides an indication

of a point or position within the graphical user interface (GUI). For example, a user of the client device **102** may provide an input to identify a location or object depicted within the GUI by providing a tactile input onto a location along the display that corresponds with a position of the location or object within the GUI.

[0092] In some embodiments, the input may comprise one or more input properties that include an input pressure, an input duration, and an input location. In such embodiments, the communication system **602** may compare one or more of the input properties against a set of threshold values. For example, responsive to detecting an input property transgress a threshold value, the communication system **602** may signal one or more systems of the contextual media filter system **124** to perform certain follow-up actions or operations.

[0093] At operation **704**, the presentation system **604** causes display of a GUI at the client device **102**, where the GUI comprises a display of live camera data streamed from a camera of or associated with the client device **102**. For example, the client device **102** may include a plurality of cameras such as one or more “front-facing” cameras, and one or more “back-facing” cameras, configured to capture and stream image data. The live camera data generated by the one or more cameras associated with the client device **102** may include image data that comprises a plurality of image features.

[0094] At operation **706** the image feature computation system **606** identifies the object within the image frame. The contextual media filter system **124** compares media content within the media repository (e.g., a database) and select those media content which are most visually similar to the object within the image frame. The visual similarity comparison is a unified abstraction and representation of the media content such that the similarity between two media content captured under, for example, different resolutions, angles, illuminations and other factors can be computed using the representation.

[0095] The image feature computation system **606** identifies local features that are computed from specific regions within the image frame. The local features are stored in an indexing structure. An indexing structure is a data structure that makes searching a database more efficient. Therefore, querying an index is faster than searching each row in a database.

[0096] Each local feature is further analyzed to compute global features of the image frame. Global features are computed from the entire image frame, not specific regions within the image frame. In one example, the global features are computed by quantizing local features of the image frame. Quantization involved in image processing is a technique achieved by compressing a range of values to a single value. The global features are computed by mapping each local feature to a representative feature in a set of representative features. Each representative feature may be referred to as a “word.” The global feature is computed by counting an occurrence of each representative feature in the set of representative features.

[0097] For example, a set of representative features may be (A, B, C, D, . . .). The image feature computation system **606** may have computed 5 local features from the image. Two local features are mapped to “word” A, and 3 local features are mapped to “word” D. The global feature can be represented as “2A0BOC3D.”

[0098] At operation 708, the search system 608 accesses media content associated with the object with the media repository in response to identifying the object. The search system 608 uses the global feature to search for media content within the indexing structure to retrieve media content from the media repository associated with object. In some examples, the search system 608 uses the k-nearest neighbors algorithm in performing the search.

[0099] At operation 708, the contextual media filter system 124 further verifies the media content using the geometric verification system 610. The media content returned by the search performed by the search system 608 may contain false media content matches that are not visually similar to the original object within the image frame. The geometric verification system 610 may use a similarity metric in determining whether a media content item is similar to the original object. The similarity metric may relate to a geometric constraint associated with the geometry of the original object. Therefore, the geometric verification system 610 identifies false media content using geometric verification and removes the false media content from the media content.

[0100] At operation 710, the presentation system 604 causes presentation of the media content within the image frame at the client device 102. For example, the presentation of the set of media content may include an AR display of the set of media content, such that the retrieved media content appears to interact with elements depicted within the image frame, in real time.

[0101] In some embodiments, to generate the presentation of the media content, the presentation system 604 retrieves a media template, wherein the media template defines a presentation format and layout to be applied to the set of media content. For example, the media template may define positions and orientations to present the media content within the image frame, at the client device 102. The media content may be tagged with location information or temporal information within the media repository, such that reference to a particular time of day, season, day of week, month, or place, may identify a set of relevant media content.

[0102] FIG. 8 is a diagrammatic illustration of an object 800 within an image frame at a client device. In some examples the object is a custom image that can be tracked within the image frame.

[0103] FIG. 9 is a diagrammatic illustrations of a contextual media filter system 124 within a user interface 900 of a client device 102. The contextual media filter system 124 may be initialized by initiating a scan of the image frame. Once the contextual media filter system 124 determines the media content associated with the object within the image frame, the contextual media filter system 124 may display a set of media content 902 that a user of a client device may swipe to select.

[0104] Reference in the specification to “one embodiment” or “an embodiment” means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present subject matter. Thus, the appearances of the phrase “in one embodiment” or “in an embodiment” appearing in various places throughout the specification are not necessarily all referring to the same embodiment.

[0105] FIG. 10 is a block diagram 1000 illustrating a software architecture 1004, which can be installed on any one or more of the devices described herein. The software

architecture 1004 is supported by hardware such as a machine 1002 that includes processors 1020, memory 1026, and I/O components 1038. In this example, the software architecture 1004 can be conceptualized as a stack of layers, where each layer provides a particular functionality. The software architecture 1004 includes layers such as an operating system 1012, libraries 1010, frameworks 1008, and applications 1006. Operationally, the applications 1006 invoke API calls 1050 through the software stack and receive messages 1052 in response to the API calls 1050.

[0106] The operating system 1012 manages hardware resources and provides common services. The operating system 1012 includes, for example, a kernel 1014, services 1016, and drivers 1022. The kernel 1014 acts as an abstraction layer between the hardware and the other software layers. For example, the kernel 1014 provides memory management, processor management (e.g., scheduling), component management, networking, and security settings, among other functionality. The services 1016 can provide other common services for the other software layers. The drivers 1022 are responsible for controlling or interfacing with the underlying hardware. For instance, the drivers 1022 can include display drivers, camera drivers, BLUETOOTH® or BLUETOOTH® Low Energy drivers, flash memory drivers, serial communication drivers (e.g., Universal Serial Bus (USB) drivers), WI-FI® drivers, audio drivers, power management drivers, and so forth.

[0107] The libraries 1010 provide a low-level common infrastructure used by the applications 1006. The libraries 1010 can include system libraries 1018 (e.g., C standard library) that provide functions such as memory allocation functions, string manipulation functions, mathematic functions, and the like. In addition, the libraries 1010 can include API libraries 1024 such as media libraries (e.g., libraries to support presentation and manipulation of various media formats such as Moving Picture Experts Group-4 (MPEG4), Advanced Video Coding (H.264 or AVC), Moving Picture Experts Group Layer-3 (MP3), Advanced Audio Coding (AAC), Adaptive Multi-Rate (AMR) audio codec, Joint Photographic Experts Group (JPEG or JPG), or Portable Network Graphics (PNG)), graphics libraries (e.g., an OpenGL framework used to render in two dimensions (2D) and three dimensions (3D) in a graphic content on a display), database libraries (e.g., SQLite to provide various relational database functions), web libraries (e.g., WebKit to provide web browsing functionality), and the like. The libraries 1010 can also include a wide variety of other libraries 1028 to provide many other APIs to the applications 1006.

[0108] The frameworks 1008 provide a high-level common infrastructure that is used by the applications 1006. For example, the frameworks 1008 provide various graphical user interface (GUI) functions, high-level resource management, and high-level location services. The frameworks 1008 can provide a broad spectrum of other APIs that can be used by the applications 1006, some of which may be specific to a particular operating system or platform.

[0109] In an example embodiment, the applications 1006 may include a home application 1036, a contacts application 1030, a browser application 1032, a book reader application 1034, a location application 1042, a media application 1044, a messaging application 1046, a game application 1048, and a broad assortment of other applications such as third-party applications 1040. The applications 1006 are programs that execute functions defined in the programs. Various program-

ming languages can be employed to create one or more of the applications **1006**, structured in a variety of manners, such as object-oriented programming languages (e.g., Objective-C, Java, or C++) or procedural programming languages (e.g., C or assembly language). In a specific example, the third-party applications **1040** (e.g., applications developed using the ANDROID™ or IOS™ software development kit (SDK) by an entity other than the vendor of the particular platform) may be mobile software running on a mobile operating system such as IOS™, ANDROID™, WINDOWS® Phone, or another mobile operating system. In this example, the third-party applications **1040** can invoke the API calls **1050** provided by the operating system **1012** to facilitate functionality described herein.

[0110] FIG. 11 is a diagrammatic representation of a machine **1100** within which instructions **1108** (e.g., software, a program, an application, an applet, an app, or other executable code) for causing the machine **1100** to perform any one or more of the methodologies discussed herein may be executed. For example, the instructions **1108** may cause the machine **1100** to execute any one or more of the methods described herein. The instructions **1108** transform the general, non-programmed machine **1100** into a particular machine **1100** programmed to carry out the described and illustrated functions in the manner described. The machine **1100** may operate as a standalone device or may be coupled (e.g., networked) to other machines. In a networked deployment, the machine **1100** may operate in the capacity of a server machine or a client machine in a server-client network environment, or as a peer machine in a peer-to-peer (or distributed) network environment. The machine **1100** may comprise, but not be limited to, a server computer, a client computer, a personal computer (PC), a tablet computer, a laptop computer, a netbook, a set-top box (STB), a PDA, an entertainment media system, a cellular telephone, a smart phone, a mobile device, a wearable device (e.g., a smart watch), a smart home device (e.g., a smart appliance), other smart devices, a web appliance, a network router, a network switch, a network bridge, or any machine capable of executing the instructions **1108**, sequentially or otherwise, that specify actions to be taken by the machine **1100**. Further, while only a single machine **1100** is illustrated, the term “machine” shall also be taken to include a collection of machines that individually or jointly execute the instructions **1108** to perform any one or more of the methodologies discussed herein.

[0111] The machine **1100** may include processors **1102**, memory **1104**, and I/O components **1142**, which may be configured to communicate with each other via a bus **1144**. In an example embodiment, the processors **1102** (e.g., a Central Processing Unit (CPU), a Reduced Instruction Set Computing (RISC) processor, a Complex Instruction Set Computing (CISC) processor, a Graphics Processing Unit (GPU), a Digital Signal Processor (DSP), an ASIC, a Radio-Frequency Integrated Circuit (RFIC), another processor, or any suitable combination thereof) may include, for example, a processor **1106** and a processor **1110** that execute the instructions **1108**. The term “processor” is intended to include multi-core processors that may comprise two or more independent processors (sometimes referred to as “cores”) that may execute instructions contemporaneously. Although FIG. 11 shows multiple processors **1102**, the machine **1100** may include a single processor with a single core, a single processor with multiple cores (e.g., a multi-

core processor), multiple processors with a single core, multiple processors with multiples cores, or any combination thereof.

[0112] The memory **1104** includes a main memory **1112**, a static memory **1114**, and a storage unit **1116**, both accessible to the processors **1102** via the bus **1144**. The main memory **1104**, the static memory **1114**, and storage unit **1116** store the instructions **1108** embodying any one or more of the methodologies or functions described herein. The instructions **1108** may also reside, completely or partially, within the main memory **1112**, within the static memory **1114**, within machine-readable medium **1118** within the storage unit **1116**, within at least one of the processors **1102** (e.g., within the processor’s cache memory), or any suitable combination thereof, during execution thereof by the machine **1100**.

[0113] The I/O components **1142** may include a wide variety of components to receive input, provide output, produce output, transmit information, exchange information, capture measurements, and so on. The specific I/O components **1142** that are included in a particular machine will depend on the type of machine. For example, portable machines such as mobile phones may include a touch input device or other such input mechanisms, while a headless server machine will likely not include such a touch input device. It will be appreciated that the I/O components **1142** may include many other components that are not shown in FIG. 11. In various example embodiments, the I/O components **1142** may include output components **1128** and input components **1130**. The output components **1128** may include visual components (e.g., a display such as a plasma display panel (PDP), a light emitting diode (LED) display, a liquid crystal display (LCD), a projector, or a cathode ray tube (CRT)), acoustic components (e.g., speakers), haptic components (e.g., a vibratory motor, resistance mechanisms), other signal generators, and so forth. The input components **1130** may include alphanumeric input components (e.g., a keyboard, a touch screen configured to receive alphanumeric input, a photo-optical keyboard, or other alphanumeric input components), point-based input components (e.g., a mouse, a touchpad, a trackball, a joystick, a motion sensor, or another pointing instrument), tactile input components (e.g., a physical button, a touch screen that provides location and/or force of touches or touch gestures, or other tactile input components), audio input components (e.g., a microphone), and the like.

[0114] In further example embodiments, the I/O components **1142** may include biometric components **1132**, motion components **1134**, environmental components **1136**, or position components **1138**, among a wide array of other components. For example, the biometric components **1132** include components to detect expressions (e.g., hand expressions, facial expressions, vocal expressions, body gestures, or eye tracking), measure biosignals (e.g., blood pressure, heart rate, body temperature, perspiration, or brain waves), identify a person (e.g., voice identification, retinal identification, facial identification, fingerprint identification, or electroencephalogram-based identification), and the like. The motion components **1134** include acceleration sensor components (e.g., accelerometer), gravitation sensor components, rotation sensor components (e.g., gyroscope), and so forth. The environmental components **1136** include, for example, illumination sensor components (e.g., photometer), temperature sensor components (e.g., one or more

thermometers that detect ambient temperature), humidity sensor components, pressure sensor components (e.g., barometer), acoustic sensor components (e.g., one or more microphones that detect background noise), proximity sensor components (e.g., infrared sensors that detect nearby objects), gas sensors (e.g., gas detection sensors to detection concentrations of hazardous gases for safety or to measure pollutants in the atmosphere), or other components that may provide indications, measurements, or signals corresponding to a surrounding physical environment. The position components **1138** include location sensor components (e.g., a GPS receiver component), altitude sensor components (e.g., altimeters or barometers that detect air pressure from which altitude may be derived), orientation sensor components (e.g., magnetometers), and the like.

[0115] Communication may be implemented using a wide variety of technologies. The I/O components **1142** further include communication components **1140** operable to couple the machine **1100** to a network **1120** or devices **1122** via a coupling **1124** and a coupling **1126**, respectively. For example, the communication components **1140** may include a network interface component or another suitable device to interface with the network **1120**. In further examples, the communication components **1140** may include wired communication components, wireless communication components, cellular communication components, Near Field Communication (NFC) components, Bluetooth® components (e.g., Bluetooth® Low Energy), WiFi® components, and other communication components to provide communication via other modalities. The devices **1122** may be another machine or any of a wide variety of peripheral devices (e.g., a peripheral device coupled via a USB).

[0116] Moreover, the communication components **1140** may detect identifiers or include components operable to detect identifiers. For example, the communication components **1140** may include Radio Frequency Identification (RFID) tag reader components, NFC smart tag detection components, optical reader components (e.g., an optical sensor to detect one-dimensional bar codes such as Universal Product Code (UPC) bar code, multi-dimensional bar codes such as Quick Response (QR) code, Aztec code, Data Matrix, Dataglyph, MaxiCode, PDF417, Ultra Code, UCC RSS-2D bar code, and other optical codes), or acoustic detection components (e.g., microphones to identify tagged audio signals). In addition, a variety of information may be derived via the communication components **1140**, such as location via Internet Protocol (IP) geolocation, location via Wi-Fi® signal triangulation, location via detecting an NFC beacon signal that may indicate a particular location, and so forth.

[0117] The various memories (e.g., memory **1104**, main memory **1112**, static memory **1114**, and/or memory of the processors **1102**) and/or storage unit **1116** may store one or more sets of instructions and data structures (e.g., software) embodying or used by any one or more of the methodologies or functions described herein. These instructions (e.g., the instructions **1108**), when executed by processors **1102**, cause various operations to implement the disclosed embodiments.

[0118] The instructions **1108** may be transmitted or received over the network **1120**, using a transmission medium, via a network interface device (e.g., a network interface component included in the communication components **1140**) and using any one of a number of well-known transfer protocols (e.g., hypertext transfer protocol (HTTP)).

Similarly, the instructions **1108** may be transmitted or received using a transmission medium via the coupling **1126** (e.g., a peer-to-peer coupling) to the devices **1122**.

1. A computer-implemented method comprising:
 - capturing an image frame at a client device, the image frame comprising a depiction of an object;
 - identifying the object within the image frame, the identifying the object within the image frame comprising:
 - identifying a first set of image features within the image frame;
 - storing the first set of features in an indexing structure;
 - identifying a second set of image features based on the first set of image features by mapping each feature in the first set of image features to a representative feature in a set of representative features;
 - searching the indexing structure using the second set of image features;
 - accessing media content associated with the object in response to identifying the object within the image frame;
 - verifying the accessed media content based on a geometric constraint associated with a geometry of the object; and
 - in response to verifying the accessed media content, causing presentation of the media content within the image frame at the client device.
2. The method of claim 1, further comprising:
 - accessing a media template, the media template defining a set of presentation positions within a graphical user interface of the client device, the set of presentation positions corresponding to presentation positions of the accessed media content, wherein defining the set of presentation positions comprises defining one or both of a presentation format and a layout of the accessed media content.
3. The method of claim 2, wherein defining the set of presentation positions comprises defining an orientation of the accessed media content.
4. The method of claim 1, wherein the accessed media content comprises a plurality of augmented reality experience selections.
5. The method of claim 4, wherein the plurality of augmented reality experience selections are configured to interact with the object within the image frame in real time.
6. The method of claim 4, wherein the plurality of augmented reality experience selections is associated with a plurality of special effects, respectively.
7. The method of claim 1, further comprising:
 - receiving an initiation of an input comprising a tactile input onto the graphical user interface of the client device;
 - detecting that a property of the tactile input transgresses a threshold value; and
 - capturing the image frame in response to the property of the tactile input transgressing the threshold value.
8. The method of claim 1, wherein the first set of features are local features identified within predefined regions within the image frame.
9. The method of claim 1, wherein the second set of image features are global features identified using an entirety of the image frame.
10. The method of claim 1, wherein the image frame is received from a messaging application on the client device.

11. A system comprising:
 a processor; and
 a memory storing instructions that, when executed by the processor, configure the processor to perform operations comprising:
 capturing an image frame at a client device, the image frame comprising a depiction of an object;
 identifying the object within the image frame, the identifying the object within the image frame comprising:
 identifying a first set of image features within the image frame;
 storing the first set of features in an indexing structure;
 identifying a second set of image features based on the first set of image features by mapping each feature in the first set of image features to a representative feature in a set of representative features;
 searching the indexing structure using the second set of image features;
 accessing media content associated with the object in response to identifying the object within the image frame;
 verifying the accessed media content based on a geometric constraint associated with a geometry of the object;
 and
 in response to verifying the accessed media content, causing presentation of the media content within the image frame at the client device.

12. The system of claim **11**, further comprising:
 accessing a media template, the media template defining a set of presentation positions within a graphical user interface of the client device, the set of presentation positions corresponding to presentation positions of the accessed media content, wherein defining the set of presentation positions comprises defining one or both of a presentation format and a layout of the accessed media content, wherein defining the set of presentation positions comprises defining one or both of a presentation format and a layout of the accessed media content.

13. The system of claim **12**, wherein defining the set of presentation positions comprises defining an orientation of the accessed media content.

14. The system of claim **11**, wherein the accessed media content comprises a plurality of augmented reality experience selections.

15. The system of claim **14**, wherein the plurality of augmented reality experience selections are configured to interact with the object within the image frame in real time.

16. The system of claim **14**, wherein the plurality of augmented reality experience selections is associated with a plurality of special effects, respectively.

17. The system of claim **11**, further comprising:
 receiving an initiation of an input comprising a tactile input onto the graphical user interface of the client device;
 detecting that a property of the tactile input transgresses a threshold value; and
 capturing the image frame in response to the property of the tactile input transgressing the threshold value.

18. The system of claim **11**, wherein the first set of features are local features identified within predefined regions within the image frame.

19. The system of claim **11**, wherein the second set of image features are global features identified using an entirety of the image frame.

20. A non-transitory machine-readable storage medium comprising instructions that, when executed by one or more processors of a machine, cause the machine to perform operations comprising:

capturing an image frame at a client device, the image frame comprising a depiction of an object;
 identifying the object within the image frame, the identifying the object within the image frame comprising:
 identifying a first set of image features within the image frame;
 storing the first set of features in an indexing structure;
 identifying a second set of image features based on the first set of image features by mapping each feature in the first set of image features to a representative feature in a set of representative features;
 searching the indexing structure using the second set of image features;
 accessing media content associated with the object in response to identifying the object within the image frame;
 verifying the accessed media content based on a geometric constraint associated with a geometry of the object;
 and
 in response to verifying the accessed media content, causing presentation of the media content within the image frame at the client device.

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